FOSSIL BOTANY.

Cours de botanique fossile fait au Muséum d'histoire naturelle. Par M. B. RENAULT. 2ème année. Paris, *Masson*, 1881. 194 p., 24 pl. 8°.

IN the first volume of this remarkable work, which was reviewed in this country a year since (*Proc. Amer. phil. soc.*), the author has exclusively considered the Diploxyleae, and given the history of each of the families of that class, — the Cycadeae, Zamiae, Cycadoxyleae, Cordaiteae, Paroxyleae, and Sigillariae. As the question of the relation of the Paroxyleae and Sigillariae is of the greatest importance for the history of the evolution of plants, it has been considered again in this year's course, though, in the preceding, the structure of the Sigillariae had been already examined. The author therefore proposes to study the most highly organized vascular cryptogams, and to search by studying the anatomy of the stems, the branches, and the roots, if, as has been asserted, any of them, at a certain point of their existence, take on the phenogamic character so distinctly that a separation of these two great divisions becomes impossible.

The essential characters of the vascular cryptogams to be examined are presented in a table. They are divisible into two prominent groups: 1°. The Lycopodiaceae and the Rhizocarpeae, which are heterospores, though some Lycopodiaceae are both heterospores and isospores; 2°. The Ophioglosseae, the Equisetaceae, and the ferns, which are isospores.

The first group of the Lycopodiaceae is that of the Lepidodendreae, beginning in the first chapter with the genera Psilophiton and Lepidodendron. Chapter 2 examines in detail the anatomical structure of three types of Lepidodendron; viz., L. Rhodumnense, L. Harcourti, and L. Justieri. Chapter 3 relates to the anatomy of the fructification of Lepidodendron or to the Lepidostrobi. Chapter 4 gives a brief examination of the characters of the other genera referred to the Lycopodiaceae. Chapter 5 compares the distinctive characters of Sigillaria and Lepidodendron, the differences, after discussion, being set forth in a comparative table; the Sigillariae being recognized as related to the phenogamous plants, and the Lepidodendreae to the Lycopodiaceae.

To the Rhizocarpeae belong, at the present epoch, the genera Pilularia, Marsilia, Salvinia, and Azolla. Of these, no remains have been found in the carboniferous; but species of the genera Sagenaria and Sphenophyllum seem to be related to this family. The history of the genus Sphenophyllum, as heretofore known, and the description of the species, are given in chapter 6. The anatomical structure of Sphenophyllum is discussed in chapter 7; the woody axis is always full, not hollow, and inflated at the articulations only when a branch is formed; the stems, the leaves, the bark, the roots, the fructification, are treated.

With chapter 8 begins the treatment of the cryptogamous isospores, which may be summarized as follows: Equisetaceae. — The living plants of this family have only one kind of spores; examination of the stems and other organs. Asterophyllites. — Tiges, branches, and principal species described; two forms of fructification described (Wolkmannia and Macrostachya). Chapter 9. Annulariae. — Description of the different organs; stems, branches, and fructification; and of the species. Chapter 10. Fructification of Annularia, considered with species of uncertain relation (Bruckmannia and Cingularia). This chapter ends with a comparative table exposing the characters of the Asterophylliteae and the Annulariae. Chapter 11 contains descriptions of the genera Schizoneura, Phyllotheca, and Equisetum. Nine species of Schizoneura and twenty of Equisetum are described, none from the paleozoic formations. The genus Calamites and its different organs are described in chapter 12.

The concluding chapter contains a table showing the different formations where the plants described in the volume have been obtained. The true Equisetaceae do not appear lower than the trias. The range of Asterophyllites, Annularia, Calamites, and the Lycopodiaceae, is from the upper Permian to the culm or subcarboniferous measures; that of Psilophitum is in the Devonian and upper Silurian. The volume ends with considerations on the distribution of the plants, on the climate as indicated by their nature, and on certain organs which may be useful in classifications. It would be useless to eulogize this excellent work, which is illustrated with twenty-three splendid plates. The above summary sufficiently shows its importance.

A NEW CALCULATION OF THE ATOMIC WEIGHTS.

Die atomgewichte der elemente, aus den originalzahlen neu berechnet. Von Dr. LOTHAR MEYER und Dr. KARL SEUBERT. Leipzig, 1883, *Breitkopf & Härtel.* 246 p. 8°.

THE great importance to chemistry of an exact knowledge of the atomic weights is well illustrated by the recent activity of chemists in

that line of investigation. About two years ago, Prof. G. F. Becker published his 'Digest'; a year later my own 'Recalculation' appeared; and now comes a third volume on the subject by Professor Lothar Meyer and Dr. Karl Seubert of Tübingen.

A comparison of this new work with the other two shows, that, in general terms, it is intermediate between them in its character. Becker collected the data relative to atomic weights, and brought them into systematic shape, but attempted no thorough recalculation. Meyer and Seubert classify and recalculate the published weighings, and make many valuable reductions of apparent weights to absolute or vacuum standards; but, with a few exceptions, they do not attempt to combine the work of different investigators, and they reject the method of least squares as inapplicable to the data at hand. My own effort was to reduce determinations as far as possible to common standards, to combine all similar data into general means, and to compute from all the evidence the most probable values for the atomic weights of the different elements. In so doing, I applied the method of least squares, and I see as yet no reason for discrediting that manner of discussion. Each of the three volumes fills a definite place; and, in any future revision of the field, each will be found a useful supplement to the others.

In general, the results obtained by Meyer and Seubert differ but slightly from mine. In comparing the atomic weights of sixty-six elements, the difference between the two recalculations falls within a tenth of a unit in thirty-seven cases, and is greater than a tenth in twenty-nine; but among the latter are found most of the rarer and less perfectly known metals. In many instances the differences are due to a trifling fundamental difference in the value assigned to oxygen. The Meyer-Seubert value is O=15.96; mine is O=15.9633: and this slight variation in the third and fourth decimal places sometimes is multiplied among the higher atomic weights to an appreciable amount. Where the two recalculations agree, they serve to confirm each other: where they differ, they indicate the important fields for further investigation. Most of the differences, however, are mainly due to differences in the manner of computation.

In some respects the new recalculation is open to criticism. Inasmuch as Meyer and Seubert rarely attempt to combine the available data, they are, perforce, compelled, in dealing with each element, to select more or less arbitrarily the results of one investigation, and give it preference over all the others. This they do without assigning reasons for their choice; and such a lack of critical statement is much to be regretted. Again: the arrangement of the material is inconvenient, notwithstanding the fact that there is a well-classified index, both for elements and for authors. For example: aluminum, instead of being discussed in a division by itself, is treated in separate ratios on pp. 22, 23, 83, 139, 151, and 193; and a comparison of the results of different investigations is thus rendered a very troublesome matter.

Some omissions are noteworthy, and seem difficult to explain. Such, for example, are Cleve's determination of the atomic weight of scandium, Julius Thomsen's synthesis of water, and Russell's hydrogen series for cobalt and nickel. Russell's work on the oxides of these metals is given, and his results receive final acceptance; but wherein they are preferable to those of Lee is not stated. Another curious set of omissions occurs under antimony. Here are cited Professor Cooke's latest bromide series, and his set of results comparing the trisulphide with the chloride. But his syntheses of sulphide from the metal, and his valuable iodide series, are altogether ignored, while his earlier bromide series barely receives mention. Finally, nothing is said concerning Dumas' investigations upon the occlusion of oxygen by silver, although no recalculation of the atomic weights can safely ignore so important a factor.

F. W. Clarke.

WILDER AND GAGE'S INTRODUCTION TO ANATOMY.

Anatomical technology as applied to the domestic cat: an introduction to human, veterinary, and comparative anatomy. By Burt G. Wilder, B.S., M.D., and Simon H. Gage, B.S. New York and Chicago, *A. S. Barnes & Co.*, 1882. 25+575 p. l. 8°.

This book the authors state to have grown out of their needs as instructors of students preparing for practical work in human, veterinary, or comparative anatomy. To students of the first and second of the above classes there is no doubt it will prove extremely useful. It is probably correct to say, that, although containing a good deal of irrelevant matter, and blemished by the unnecessarily extensive employment of a novel terminology, it contains by far the best set of directions for the dissection of a mammal below man in the scale, ever published for the use of that large class who prefer or are compelled to enter